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SUMMARY OF DECONTAMINATION STUDIES AT OAK RIDGE NATIONAL LABORATORY
Period of June 1-December 1, 1961

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ABSTRACT

A semiannual summary of ORNL decontamination studies, with a guide to published papers, is presented for expanded discussion at the November 30-December 1 meeting of the RDIEG at Savannah River.

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Decontamination Studies at ORNL
June 1 - Dec. 1, 1961

The development and testing of oxalate-peroxide mixtures as general decontaminants was continued (1-5).

The corrosion behavior of oxalate-peroxide mixtures containing citrate, acetate, or glycolate as buffers was studied on seven metals. At 95°C and pH 4.0, carbon steel corrosion was accelerated by 0.05 M H_2O_2 to 2-4 mils/hr. At pH 4.5 and 5.0, there was also accelerated corrosion when 0.1 M citrate was present with the 0.3 M oxalate, but not when acetate or glycolate were used as buffers instead of citrate. In all solutions, corrosion inhibition on carbon steel occurred when the H_2O_2 concentration was 0.2 M or above. Aluminum corroded at a rate of 0.02-0.04 mils/hr.

Acetate, as proposed at Hanford and Argonne for buffering oxalate-peroxide mixtures, did not cause the production of significant quantities of hazardous peracetic acid, and did not lower either the speed of dissolution of UO_2 or the decontamination efficiency of the solution. Acetate also had more desirable corrosion characteristics than citrate. Ammonium acetate is used at ORNL, instead of an alkali acetate, in order to increase buffering action and to continue to ensure that all of the waste products are volatile.

Carrier-free Cs-137 and I-131 were deposited onto various metals from helium at EGCR temperatures, and decontaminated by various reagents. Oxalate-peroxides rated well in this study.

Nonsmearable americium on type 347 stainless steel was decontaminated by factors of 23 to 635 by various acidic reagents in 20 min at 95°C. Fluoride aided the decontamination. The decontamination factor in noncorrosive oxalate-peroxide was 80. Hydrogen peroxide is an effective corrosion inhibitor in mildly acidic fluoride solutions.

Oxalate-peroxide at a pH of 2.5 was almost as effective a decontaminant at 60°C as at pH 4.5 at 95°C, if double to triple the contact times were used. Corrosion inhibition by 0.5 M peroxide failed above 65°C at pH 2.5. The solution at 60°C did not remove rust, but at 95°C was an excellent low-corrosive rust solvent and metal decontaminant for rusty hand tools. Large quantities of rust shortened the life of the solution to about 2 hr.

Complex machined tools of steel and aluminum used in hot cells were completely decontaminated, with negligible corrosion, by oxalate-peroxide mixtures at 90-95°C.

The production of blue oxide coatings on carbon steel by traces of oxygen in helium at EGCR temperatures is now under investigation. Future work includes more extensive simulation of contamination under EGCR conditions, and decontamination by suitable reagents.

REFERENCES

1. "Gas Cooled Reactor Program Quarterly Progress Report," Period Ending June 30, 1961, ORNL-3166, pp. 55-57 (Aug. 28, 1961).

2. Ibid., Period Ending September 30, 1961 (in press).

3. "Oak Ridge National Laboratory Status and Progress Report - June 1961," ORNL-3156, p. 23 (July 11, 1961).

4. Ibid., August 1961, ORNL-3190, p. 21 (Sept. 11, 1961).

5. Ibid., October 1961, ORNL-3223, p. 23 (Nov. 7, 1961).

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